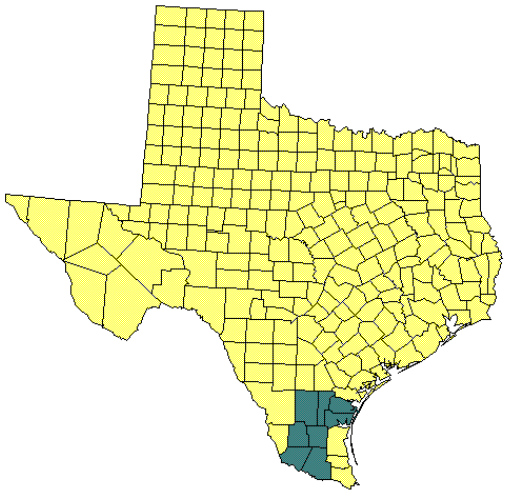
Revitalizing Mature Oil Play Strategies for Finding and Producing Unrecovered Oil in Frio Fluvial-Deltaic Reservoirs of South Texas -- Class I

Bureau of Economic Geology

Frio Formation	Vicksburg Fault Zone
@ 2,000 ft.	Nine South Texas Counties
Oligocene	Texas Coastal Plain



DE-FC22-93BC14959

Contract Period:
10/21/1992 to 8/31/1996

DOE Project Manager:
Chandra M.Nautiyal
918/ 699-2021
cnautiyal@npto.doe.gov

Contractor:
Bureau of Economic Geology
University Station Box 7726
Austin, TX 78713

Principal Investigator:
Paul Knox
University of Texas @ Austin
University Station, Box 7726
Austin, TX 78713-7726
512/ 471-1534
512/ 471-0140
http://utexas.edu/research.beg

Objective: The objectives of this project are to develop interwell-scale geological facies models and assess engineering attributes of Frio fluvial-deltaic reservoirs in selected fields in order to characterize reservoir architecture, flow unit boundaries, and the controls that these characteristics exert on the location and volume of unrecovered mobile and residual oil. Technology transfer will be coordinated through producer organizations.

Technologies Used: 3-D seismic, methods of evaluating old electric logs, Visual Basic 4.0 and Access Software, and StrataModel Software.

Background: The Bureau of Economic Geology has focused efforts on the Frio fluvial/deltaic sandstone associated with the Vicksburg Fault Zone in South Texas; Hidalgo, Starr, Brooks, Jim Hogg, Jim Wells, Duval, Kleberg, and Nueces Counties. Seventy reservoirs out of 129 in this oil play have already been abandoned. Estimates are that 1.6 billion bbl of unrecovered mobile oil will remain unproduced unless advanced reservoir characterization techniques are applied. Advanced reservoir characterization techniques including high-frequency stratigraphic analysis, stratigraphic analysis of 3-D seismic data, and 3-D reservoir modeling will be applied to selected reservoirs in the Frio fluvial-Deltaic Sandstone (Vicksburg Fault Zone) trend of South Texas.

Incremental Production: 500 Mcfd

Expected Benefits and Applications: The results of these studies will lead directly to the identification of specific opportunities to exploit these heterogeneous reservoirs for incremental recovery by recompletion and strategic infill drilling Development of an illustrated microcomputer-based guide to reservoir characterization, Geologic Advisor Software.

Accomplishments: Development of Geologic Advisor Software which will allow more detailed, accurate, and rapid analysis of mature oil reservoirs. The computer program takes the results beyond the geological interpretation to statistical and engineering models. Reservoirs were screened from fields within the Frio Fluvial-Deltaic Sandstone (Vicksburg Fault Zone) oil play of South Texas, and two fields were selected for detailed study: T-C-B Field, located in the northern part of the trend in Jim Wells Co., and Rincon Field, located in the south in Starr Co. Regional reservoir characterization, including statistical analysis of the remaining oil resource potential of the play, has been completed, and a Topical Report explaining statistical methodology and results has been published. Detailed characterization studies have targeted those reservoirs in T-C-B and Rincon fields that have the greatest potential for untapped compartments and new pools. A Topical Report, summarized the multidisciplinary characterization methods used, with specific examples from Rincon Field. Results of this work were the focus of a workshop developed by the Bureau of Economic Geology and TIPRO in cooperation with GRI, DOE, the State of Texas, and PTTC and presented to operators within the play in the summer of 1995. A model has been developed that allows the prediction of reservoir architecture and heterogeneity based on position within a depositional cycle. This model was presented to representatives of eight major U.S. and foreign oil companies as part of a field trip sponsored by GRI in the summer of 1995 Technology Transfer for this project has included 15 publications, plus presentations at 8 technical conferences.

Publications: (1) McRae, L. E., and M. H. Holtz, 1995, "Strategies for Optimizing Incremental Recovery from Mature Reservoirs in Oligocene Frio Fluvial-Deltaic Sandstones, Rincon Field, South Texas": Transactions, Gulf Coast Association of Geological Societies, v. 45, p. 423-433. (2) Knox, P. R., and L. E. McRae, 1995, "Application of Sequence Stratigraphy for Prioritizing Mature Reservoirs for Incremental Growth Opportunities, An Example from Frio Fluvial-Deltaic Reservoirs", T-C-B Field, South Texas: Transactions, Gulf Coast Association of Geological Societies, v, 45, 0. 341-350. (3) Holtz, M. H., 1996, "Reservoir Characterization Methodology to Identify Reserve Growth Potential": SPE/DOE Improved Oil Recovery Conference, April 22, Tulsa, Oklahoma, Transactions. (4) Knox, P. and M. Barton, 1999. "Predicting interwell heterogeneity in fluvial-deltaic reservoirs: Effects of progressive architecture variation through a depositional cycle from outcrop and subsurface observations" *in* R. Schatzinger and J. F. Jordan, Editors, Reservoir Characterization - Recent Advances, AAPG Memoir 71, AAPG, Tulsa, OK, p. 57-72.

Recent/Upcoming Technology Transfer Events: (1) May 19-22, 1996, AAPG Annual Meeting, P. R. Knox, “Accommodation-Based Controls on Fluvial-Deltaic Reservoir Compartmentalization: Examples from the Oligocene Frio Formation, South Texas", San Diego, CA. (2) June 6, 1996, Houston Geological Society Continuing Education Shortcourse, "New Oil from Old Fields: Identifying Opportunities for Reserve-Growth

Potential in Mature Fields of the Frio Fluvial-Deltaic Sandstone Play, Vicksburg Fault Zone", Houston, Texas. (3) October 4, 1996, GCAGS Annual Meeting, P.R. Knox, "Determining Between-Well Reservoir Architecture in Deltaic Sandstones Using Only Well Data: Oligocene Frio Formation, Tijerina-Canales-Blucher Field, South Texas". (4) Knox, Paul and Mark Barton, Mar 2-4 1997. "Predicting Interwell Heterogeneity in Fluvial-Deltaic Reservoirs: Outcrop Observation and Applications of Progressive Facies Variation Through a Depositional Cycle": Fourth International Reservoir Characterization Technical Conference; Houston, Texas. (5) Paul Knox, "The Reservoir Characterization Advisor": University of Texas, BEG, Software Demonstration, DOE Oil and Gas Conference, Workshop, June 28-30, 1999, Dallas Texas.

Project Status: Project completed. Final report published September 1996.